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[0002]

Typically, a current output-type digital/analog conversion circuit receives a reference current to control an output current with the use of a digital input signal.

[0003]

Fig. 2 shows one example of such a conventional current output-type digital/analog conversion circuit.

[0004]

As shown in Fig. 2, transistors 36 and 37 are identical in shape to each other, and resistors 38 and 39 are identical in resistance value to each other. Each of the resistors 38 and 39 has one terminal corresponding to a first current mirror circuit connected to a power supply terminal. The current mirror circuit has an input connected to a reference current source 1 and an output connected to an input of a second current mirror circuit.

[0005]

The second current mirror circuit is grounded through a transistor 40 and a resistor 45 each serving as an input of the current mirror circuit. The second current mirror has first to "n"th outputs. Herein, the first output is configured by a circuit grounded through a transistor 41 which is identical in shape to the transistor 40, a resistor 46 which is identical in resistance value to the resistor

45, and a switch 20 which is controlled by a first bit of the digital input signal, and outputs a current which is equal to the current from the reference current source. The second output is configured by a circuit grounded through a transistor 42 which is twice larger in area than the transistor 40, a resistor 47 which is smaller in resistance value than the resistor 45 by one-half, and a switch 21 which is controlled by a second bit of the digital input signal, and outputs a current which is twice larger than the current from the reference current source. The third output is configured by a circuit grounded through a transistor 43 which is four times larger in area than the transistor 40, a resistor 48 which is smaller in resistance value than the resistor 45 by one-quarter, and a switch 22 which is controlled by a third bit of the digital input signal, and outputs a current which is four times larger than the current from the reference current source. Likewise, the "n"th output is configured by a circuit grounded through a transistor 44 which is $2^{n-1}$ times larger in area than the transistor 40, a resistor 49 which is smaller in resistance value than the resistor 45 by $1/2^{n-1}$, and a switch 23 which is controlled by an "n"th bit of the digital input signal, and outputs a current which is $2^{n-1}$ times larger than the current from the reference current source. Herein, the first to "n"th outputs of the second current mirror

circuit are connected to an output terminal.

[0006]

Next, description will be given of operations of the conventional current output-type digital/analog conversion circuit.

[0007]

The digital input signal composed of the "n" bits are supplied to the switches, respectively. When only the signal corresponding to the first bit becomes HIGH, the switch 20 is turned ON. Thus, a current which is equal to the current from the reference current source is fed to the output terminal. When only the signal corresponding to the second bit becomes HIGH, the switch 21 is turned ON. Thus, a current which is twice larger than the current from the reference current source is fed to the output terminal. When the first bit and the second bit are turned ON simultaneously, a current which is three times larger than the current from the reference current source is fed to the output terminal. Likewise, when all the "n" bits are turned ON, a current which is $2^{n-1}$ times larger than the current from the reference current source is fed to the output terminal.

[0008]

Accordingly, the following equation is established.

[0009]

$$I_{out} = I_{ref}\ (Z_1 + 2Z_2 + 4Z_3 + \ldots + 2^{n-1}Z_n)$$

In this equation, $I_{out}$ represents a current fed to the output terminal, and $I_{ref}$ represents a current value of the reference current source. Moreover, 1 is substituted for Zn when the "n"th bit is turned ON, and 0 is substituted for Zn when the "n"th bit is turned OFF.